the temperature of the comet is of the same order as the laboratory temperature, and high enough to produce incandescence, yet it is not sufficiently high to dissociate the compounds and thus produce the hydrogen and nitrogen spectra as obtained in the laboratory.

In the concluding portion of his communication M. Deslandres describes some experiments, similar to those by which he has obtained such excellent results in determining planetary rotations, whereby the differential movements of a comet's various parts may be determined from the inclination of its spectral lines to the lines of two comparison spectra photographed alongside the spectrum of the comet.

THE SPECTRUM OF NOVA GEMINORUM.—A telegram from Prof. Pickering, published in No. 3895 of the *Astronomische Nachrichten*, announces that the spectrum of Nova Geminorum was observed by Dr. H. D. Curtis at the Lick Observatory on August 17, and was seen to be of the nebular type which is characteristic of the spectra of declining temporary stars.

UNITED STATES NAVAL OBSERVATORY.—Vol. iii. (second series) of the United States Naval Observatory *Publications* has been received, and contains some 550 pages of useful observational details and results.

Part i. is devoted to observations of Eros made with the twenty-six inch equatorial and the Clark micrometer "No. ii," during 1900–1901, by Messrs. T. J. J. See and G. K. Lawton. After a description of the instrument, which has recently been supplied with an entirely new mounting by Messrs. Warner and Swasey, Dr. See proceeds to give details of the instrumental constants and their determination, and then gives the results of the individual observations for each night.

Assistant-astronomer King has used the nine-inch transit circle for observations of Eros and the reference stars suggested by the Conférence Astrographique Internationale of July, 1900, and, in part ii. of the report, gives the individual results of his observations.

Part iii. is a detailed description of the observations of 495 zodiacal stars made with the nine-inch transit circle by Prof. Eichelberger in accordance with Sir David Gill's catalogue of 2798 zodiacal stars which it was intended to observe, but in November, 1900, it was found that the pivots of the instrument were badly worn, and therefore the work is suspended until the necessary repairs have been effected.

In part iv. Mr. Updegraff gives a description, a photograph, and a diagrammatic sketch of the six-inch steel transit circle, and in a lengthy introduction gives minute details of the determination and reduction of the instrumental constants, followed by the separate observations of 130 comparison stars for the planets, including a large number of observations of reference stars for Eros. This section is concluded by two catalogues of stars and their positions, the first containing 139 zodiacal stars, and the second the Eros reference stars.

Part v. concludes this publication, and contains the individual observations made with the prime-vertical transit instrument from 1882 to 1884 by Lieutenants Ingersoll and Bowman and Ensign Taylor, all of the U.S.A. Navy.

THE WHITE SPOTS ON SATURN.—In the *Astronomische Nachrichten*, No. 3894, Senor J. Comas Solá, of Barcelona, publishes his observations of Barnard's white spot and the smaller white spots which have been recently observed on Saturn.

Using a six-inch equatorial, he easily observed Barnard's spot and several smaller ones. On June 26 the former crossed the central meridian at 13h. 19m. (G.M.T.), and was seen to be double, whilst in contact with it, and on the left side (reversed image) a small spot was observed. On July 1d. 13h. 55m. ± a feebler spot, which also appeared double, was observed to cross the central meridian in the same zone as the larger one. By July 20, when it crossed the meridian at 11h. 32m., the large spot was seen to be much feebler and apparently elongated, and on July 28 (time of transit = 11h. 15m.) it was yet feebler, and a rather difficult object for the six-inch.

Several other spots were observed, and their times of transit recorded, by Senor Solá, and, as a first approximation, he finds the rotation period of the planet to be 10h. 38·4m.

THE TEACHING OF PSYCHOLOGY IN UNIVERSITIES OF THE UNITED STATES.[1]

A TRUE estimate of the position of psychology in the curriculum of American universities can hardly be formed without a brief survey of the general system of education which prevails there. In earlier years, one need hardly say, the training was far narrower and less liberal than it is now. The candidate for the B.A. degree had his educational career as carefully prescribed for him as if he were still at school, and he had little or no opportunity to deviate from it. At the present day, the various universities of the United States offer every gradation between relatively elective and relatively non-elective systems of study. In most universities the undergraduate will find his course of work strictly defined during at least his first or freshman year. Little by little, however, the elective is gradually replacing the non-elective system. Quite recently, Harvard, for example, determined to allow a very considerable measure of optional subjects, from which the student has to make his choice from the moment he is admitted to the university.

The danger of such a system is increased by the absence of any special *ad hoc* examination for the B.A. degree. As a rule, this degree is conferred solely on the results of the terminal examinations held biannually, so that, unless proper precautions were taken, it would be possible for a student, after having passed his three or four years at college, to graduate on the basis of a superficial and very elementary knowledge of many subjects, and a detailed knowledge of none. This drawback American universities have largely succeeded in overcoming by a series of appropriate regulations concerning the relative number of elementary and advanced lectures at which attendance is required, and concerning the conditions of admission to advanced lectures. At Yale, for example, undergraduate studies are ranged under three heads:—(1) Languages and literature; (2) mathematics, physical and natural science; (3) philosophy, history and the social sciences. Every student is required to have attended advanced courses in at least one of these departments, and to show at least an elementary knowledge of subjects in the two other departments.

It will now be evident why subjects which in English universities are studied by the few are in America taken up by the many. Take Yale, for instance, with her department of philosophy, history and the social sciences. Every undergraduate has to show at least an elementary knowledge of some subject in this department, *i.e.* of philosophy, psychology, ethics, pedagogics, logic, ancient, mediæval and modern history, economics, politics or sociology. Large numbers of American students take a course of economics. At one university I was told that, on an average, every student takes two courses of economics during his undergraduate career. This fact may be ranged beside another, viz. that there are twenty-four professors, lecturers and instructors of political economy at Harvard.

So also it comes about that a great number of students take up psychology, either by itself or with allied subjects. 250 students, chiefly in their second or sophomore year, attend the year's course at Harvard, which is equally divided between the study of logic and the study of elementary psychology. At Yale a similar year's course on ethics and psychology was attended this year by 225 students. At Cornell the year's course on psychology, logic and ethics is attended by 200 students. Princeton goes so far as to make psychology a compulsory subject, without which the B.A. degree cannot be obtained. The popularity of psychology is also shown in that it is taught in the upper forms of some of the better schools.

Experimental work in the laboratory is only performed by students who intend to proceed further in psychology. Their number is a very small fraction—from one-tenth to one-fifteenth—of those who attend the preliminary course. At Columbia they are expected to have attended either a general course on experimental psychology or a special course, in which no less than eight lecturers take part, each being responsible for a few lectures in his own department of psychology, be it physiological, genetic, comparative,

[1] Paper read before the Psychological Society at Cambridge, July 25, by Dr. C. S. Myers.

pathological, experimental, historical or philosophical. By this means the student comes into relation with most of the teaching staff of the department in which he is interested. Later, more advanced courses are open to him in analytical psychology, educational psychology, the philosophy of mind, genetic psychology, and so on. At Pennsylvania the student spends two years at psychology, devoting the first half-year to analytical psychology, the second half-year to physiological psychology, the third half-year to synthetic psychology, and the fourth half-year to experimental psychology. Each of these half-courses comprises lectures and practical work, of an hour and two hours' duration respectively per week.

It would be wearisome to follow out at further length the various lines of undergraduate study pursued in psychology at the several universities visited by me. You will, however, hear with interest that men are offered at Yale a course of recent German psychology in their fourth or senior year, the class reading extracts from the works of Brentano, Wundt, Stumpf, Külpe, and others, while the different attitudes of these psychologists are explained by the instructor. At Harvard a half-year's course on the mental life of animals is offered, accompanied by lectures and demonstrations. At Cornell a course on the history of the psychophysical work of Weber, Fechner, and others is given.

This brings me to the more detailed consideration of experimental work in the United States. The laboratory in Harvard University has eleven rooms, in Yale it has seven, in Columbia nineteen, in Princeton five, in Cornell ten, and in Clark ten; these numbers generally include all public and private rooms of the department. Cornell has undoubtedly the best equipped laboratory, so far as human psychology is concerned. Two rooms here are devoted to vision, one to acoustics, one to touch, one to taste and smell, one to chronometric apparatus, one is a special research room, and there is a lecture room and a workshop. Both Clark and Harvard have rooms devoted to experiments on animals. Partly for this reason the Harvard laboratory suffers from lack of space; a new one will be built in the near future. Most laboratories have a departmental library, or at least a seminary, in which the students can read or meet for discussion. Practically all the laboratories have a workshop, and employ a trained mechanician, who is able to turn out even complicated and expensive apparatus.

The methods of conducting the experimental work naturally differ in the various laboratories. At Harvard and Columbia lectures are given in connection with the experiments, but at many other universities lectures and practical work are wholly independent. At Yale, Harvard, Princeton and Cornell, students work together in pairs, each member of a pair serving alternately as subject and as experimenter. At Pennsylvania students work together in groups of three, the third recording the results obtained by the two others. Stress is laid in most laboratories on the careful keeping of note-books. Many of those in Cornell are models of neatness and diligence; there they are inspected, marked and initialled monthly by the assistants. At Princeton, the times are so arranged that only a single pair of students is working in the laboratory at any one hour; they thus secure the undivided attention of the instructor. At Harvard and Pennsylvania the entire class is engaged upon the same kind of experiment simultaneously; the Pennslyvania students are each provided with lockers containing the simpler apparatus they are likely to use. At Yale and Cornell, on the other hand, students are simultaneously engaged at different experiments; one pair, for instance, is working on colour-vision, another on reaction-times, another on tactile sensibility, and so on. Save at Cornell, the students are each taken through all the laboratory experiments commonly described in the text-books. But at Cornell it is held sufficient for the student to devote himself to the investigation of a single sense, working over perhaps fifteen experiments therein, and then to proceed to one or two experiments on the expression of the affective states, thence to some of the experiments in attention and reaction, and so on, whereby he acquires a practical experience, less extensive, but probably more thorough than that usually obtained. He works four and a half months in qualitative, and four and a half months in quantitative, experimental work during his third year. His fourth year is devoted to some special problem, and he writes an essay on his results.

If, having taken his B.A. degree, the graduate determines to pursue his studies further, he enters the post-graduate school in order to proceed to his doctor's degree. After two or three years' post-graduate study, he may present himself for examination in a chosen division, *e.g.* philosophy, and within the division he must name some special field of study, *e.g.* psychology, in which he is liable to minute examination and must offer a thesis, showing evidence of independent research. In psychology, as in all subjects, advanced lectures are delivered to suit his requirements. At Cornell during his first year of post-graduate study, the student does not start any special research work; he reads and roams about the laboratory, observing what his senior fellow-students are doing. A very large proportion of post-graduate students at Yale and Harvard consists of graduates from smaller universities. At Harvard I found no less than sixteen students engaged in the psychological laboratory at original work for their Ph.D. degree. They attended there at fixed times in the mornings only, working in pairs alternately as subject and as experimenter. Weekly seminary meetings are held at Harvard, Yale, and Clark for post-graduate students. At Harvard three papers are read at each evening meeting by the students, and are discussed by themselves and their professors. At the Yale seminaries, a post-graduate student presents a paper weekly, dealing with the system of some well-known mental philosopher. At Clark, the students meet each week at the professor's house to narrate and criticise their progress in research work.

A very large proportion of theses, written for the Ph.D. degree in psychology, sees light in the pages of American psychological journals. In many instances this must turn out to be the one piece of original work such men have performed in their life. They drift away in various directions. The best are chosen by their professors to be laboratory instructors for a year or more. Thence they go to become assistant professors in other universities, or depart earlier to teach educational psychology in the State normal schools or in other teachers' training colleges. Mainly through lack of leisure, the majority put forth little in the way of further and mature research. There is a strong tendency, too, for psychologists in America to turn to editorial or literary work, to become busy with the organisation of science, or to deal with purely philosophical, ethical, or religious problems.

But apart from such drawbacks, which are the result rather of American ways of life and character than of deficient interest or training, I have said enough, I hope, to show what a living subject of education psychology is in the United States. It is becoming recognised there that a man of culture should know something, not only of the works, but also of the working, of the human mind. Psychology in the United States is not a subject of the philosophical few, as it is in our country. If it pays the penalty for, it also reaps the advantage of, its position. Numbers of undergraduate students acquire a notion, however dim and imperfect, of the range and importance of psychology, so that, if ever they become successful business men, as many of them do, they are prepared to lend it financial assistance in later life. Future medical students take up psychology during their academic career, and turn their knowledge of it to account when they come to deal with the problems of insanity. Zoologists pass from their museums to study it, and return to work out the psychology of animal life. Teachers obtain a useful smattering of it, sufficient to interest and improve them in their arduous career. At Pennsylvania, for example, they have the opportunity of attending a "pedagogical clinic," at which children with various mental disorders are brought before their notice, so that they may recognise them hereafter.

From these facts it will be seen that America provides us with a lesson in the organised teaching of a subject the success of which we have so much at heart, and with an example which we should do well to follow.